GRASSLANDS OF THE NEW ENGLAND TABLELAND IN THE NINETEENTH CENTURY

The present state of New England grasslands is largely a function of the vegetation as it existed at the time of European settlement and the impact of pastoral management during the last one hundred and fifty years. Considerable changes have probably occurred since the days when the pioneers first drove their flocks onto the tableland, but in order to understand these changes it is necessary to know something of the structure and floristics of the grasslands of that period. The principal sources of information on this subject are the writings of early squatters and the tutor William Gardner, all with very little or no botanical training. The following study is severely limited by a dearth of informed, original material.

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Explorers

The first explorers to reach New England were Oxley and his party, who ascended the range near the present township of Limbri in 1818. After some "precipitous travelling", Oxley reported that the top country was "well clothed with grass" and displayed "a great number of fallen trees [which] was in some measure accounted for by the men observing about a dozen trees on fire near this [aboriginal] camp, no doubt the more easily to expel the opossums, rats, and other vermin which inhabit their hollows."[1] Continuing east, he crossed the Apsley River a few miles south of the spot where Walcha now stands,[2] and wrote, on 8 September:

> " . . . we proceeded through the finest open country, or rather park, imaginable: the general quality of the soil excellent . . . "[3]

The firing and burning by aborigines receives further attention later in the article; as for Oxley's park-like countryside near Walcha, the description undoubtedly influenced the tableland's first squatter, who re-discovered the region in 1832.

The journals of two other explorers who reached the Peel River add little to the record. Allan Cunningham's expedition in 1827 approached the tableland from the south, but the rugged nature of the range diverted him to the north west.[4] His northward progress

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1. John Oxley, *Journal of Two Expeditions into the Interior of New South Wales,* London, 1820, pp. 287, 289-290.
2. Subsequent references to townships in this article denote the site of the town rather than the township itself.
3. Oxley, *op. cit.*, p. 291.
4. Ida (Lee) Marriott, *Early Explorers in Australia,* London, 1925, p. 550. Marriott quotes Cunningham's journal where he observes:

> " . . . the country to the north-east and east appeared lofty, broken and submountainous, the ranges thickly wooded and seemingly grassy, yet the abrupt character of their western acclivities obliged me to abandon the design of proceeding northward from Peel's River."

remained west of the tableland through lightly-timbered, occasionally very open country with "patches of plain", drought-stricken but well-grassed, the drought resistance of the native grasses by the Macintyre River deserving his commendation.[5] The return journey from the Darling Downs took him across the Dumaresq River about thirty miles west of Tenterfield, but he was no longer interested in the ranges and travelled south-west to rejoin his trail near Warialda, noting "good grass" periodically in his journal.[6] Thomas Mitchell made two expeditions, in 1831 and 1846, which passed close by the tableland on the western side. His remarks on species found and collected are of little value to the student of New England vegetation.[7]

Pioneer Squatters

The interval of fourteen years between Oxley's discovery and the advent of pastoral settlement is explained by Campbell as being due to the inaccessible nature of the eastern and southern margins, and the indifferent pasturage of the granite belt confronting pioneers from the west.[8]

In 1832 the first pioneers ventured onto the tableland; they were Hamilton Collins Sempill and Edward Gostwych Cory.[9] Sempill brought his Hunter Valley flocks up the Nundle spur and settled at Walcha, while Cory, displaced from his runs on the Liverpool Plains by the Australian Agricultural Company, ascended the Moonbi ranges and established himself at Gostwyck. In 1840 there were sixty six stations scattered loosely over the tableland and by 1848 the best grazing land in New England was already occupied, the next eight years adding only ten new stations, most of them situated in the rough country of the eastern highlands.[10] These early holdings were mainly taken up by squatters seeking

> "a more or less abundant supply of grass and water which could be obtained there for the starving flocks of the lowlands during times of drought";

the majority resided on their southern properties and sent experienced bushmen to look after their New England runs.[11]

There were several reasons for the reluctance of squatters to occupy the tablelands. Many were landowners in the Hunter Valley and preferred to build homesteads there, rather than risk unnecessary capital improvements on squattages with insecure tenure.[12] The frosty

5. Marriott, *op. cit.*, pp. 556-558. Cunningham comments in his journal:

> "We were surprised to observe how wonderfully the native grasses had resisted the dry weather on the upper banks of this dried watercourse. They appeared fresh and nutritive, affording abundance of provision . . ."

6. *ibid.*, pp. 574-577.
7. T. Mitchell, *Three Expeditions into the Interior of Eastern Australia,* 2 vols., London, 1838, Vol. I, and T. Mitchell, *Journal of an Expedition into the Interior of Tropical Australia,* London, 1848.
8. J.F. Campbell, "Discovery and Early Pastoral Settlement of New England", *Royal Australian Historical Society, Journal and Proceedings,* Vol. 8. (1922), p. 246.
9. R.B. Walker, *Old New England,* Sydney, 1966, p. 11.
10. *ibid.*, p. 42.
11. Campbell, *op. cit.*, p. 234.
12. *ibid.*, p. 238.

winters and difficulty of access also militated against permanent occupancy in the early stages of settlement.[13] The handful of pioneer squatters who did live on their runs record in their diaries and letters many details and trials of the squatting life, but, unfortunately for our purposes, they concentrated on economic problems, home cultivations for subsistence cropping, building huts and fences and chasing stray cattle; pasture evaluation was largely overlooked, and in practice remained the day-to-day responsibility of the hired shepherd.[14]

From the few references to the vegetation in the available records, it is evident that Oxley's impressions of the Walcha country could have been applied to most of New England. John Everett, who with his brother George took up "Ollera" near Wandsworth, made the following notes in his diary in 1838;

> "There is plenty of grass in all directions and plenty of water. It is too open for cattle . . . . Large flats with water running through them, open down-like plains . . . . It is not densely wood, but more like open park scenery . . . the soil of some flats very good, no necessity for clearing".[15]

On taking up his run at Strathbogie, Frederick Lamotte reported "fine open country, with small plains and beautiful ridges",[16] and Captain Henderson in 1851 also remarked on the "openness of the countryside and thinness of the wood".[17] This opinion is further supported by M.H. Marsh who acquired Salisbury station in 1840,[18] and by George Mundy on the occasion of his visit to Salisbury Plains in 1847. Mr. Mundy was by no means attracted to the tableland, however suitable it might be for grazing sheep:

> "The country we passed through latterly did not give us a very favourable idea of the soil of New England, its vegetation, or its scenery. The timber is poor in size and tiresome of aspect. Being lightly wooded, it is however well calculated for stock farming.[19]
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> . . . . . .
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> Salisbury Plains is an undulating tract clear of trees and scrub, and clothed with good grass. Both pasturage and climate are admirably adapted to sheep farming. They are suitable also for breeding, but not for the feeding and fattening of horned stock."[20]

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13. *ibid.*, p. 234.
14. A.V. Cane, ' "Ollera" 1838-1900', M.A. Thesis, Sydney University, 1949, pp. 550-586. Correspondence of Thomas Tourle, *passim,* comprising letters written from Balala to England, 1839 to 1845, photocopy held by Mr. R. Hudson, Balala. *Memoirs of Edward and Leonard Irby* (1841 to 1845) [hereafter referred to as Irby Memoirs], typescript of book published by William Brooks, Sydney, 1908, *passim.*
15. J. Everett, diary, 1838, University of New England Archives. There is no reference to any date in the diary after a statement that he left Sydney, 11 November, 1838, on his way to New England.
16. F.C. Lamotte, letter dated 5 April, 1840, quoted in full by R.L. Dawson, "Outback from the Hunter, New South Wales, to 'New Caledonia' and the Severn River in 1840", *Royal Australian Historical Society, Journal and Proceedings,* Vol. 15 (1929), pp. 44-46.
17. Captain Henderson, *Excursions in New South Wales,* 1851, p. 244, quoted by Cane, *op. cit.* p. 24.
18. M.H. Marsh, *Overland from Southampton to Queensland,* London, 1867, p. 55.
19. G.C. Mundy, *Our Antipodes; or, Residence and Rambles in the Australasian Colonies, with a Glimpse of the Goldfields,* 3 Vols., London, 1852, Vol. 2, p. 33.
20. *ibid.*, p. 36.

Observations on the grassland itself are meagre. Edward Irby wrote in a letter from Deepwater station in 1842:

> "The grass grows very differently here to what it does in England. At a distance it appears as though the ground were well covered with it, but when you are walking you will perceive that half the surface is bare". [21]

On a page of the Old Letter Book dated 1840, John Everett reported:

> ". . . . those open grassy parklike tracts of which so much has been said characterise the secondary range of granite and porphyry . . . the grass was chiefly of the kind called oat or forest grass which grows in tufts at considerable distances from one another and which generally affords good pasturage." [22]

These two extracts indicate the tussocky structure of the grassland, suggesting dominance by a caespitose perennial.

On the high ranges near the eastern edge of the tableland, however, the ground is described by Gardner as

> "covered with a thick sward of grass similar to the grass fields in England. Grass does not grow in tufts in that part of the country as it does in most parts of New South Wales. . . ." [23]

The eastern highlands were the last and least attractive areas to be settled, and remain generally lightly stocked and heavily timbered to the present day.

The licenced holdings established by the squatters were

> "usually bounded by leading ridges, and embraced the valley or valleys lying between. They were briefly described as embracing all the land drained by a main stream and its tributaries". [24]

The natural ridge boundaries were timbered and often rocky - "rough country" usually avoided by the shepherds. [25]

The grazing value of the New England grasslands in the pioneering days is difficult to assess. In 1840 Governor Gipps referred to the region as "a wonderful extent of comparatively flat land . . . . one of the best grazing Districts in the Colony."[26] His description may have been influenced by reports from squatters during the succession of

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21. Edward Irby to his mother, 1 November, 1842, in Irby Memoirs, *op. cit.*, p. 38.
22. J. Everett, Old Letter Book, University of New England Archives. The Book contains various jottings written from 1836 to 1849 including copies of business letters dated 1843 to 1848. A two-page account of the vegetation of New England dated 1840 appears among the business letters in between two letters to Mr. W. Dawes, one dated 14 April, 1847, and the other undated.
23. William Gardner, *Production and Resources of the Northern and Western Districts of New South Wales,* 2 Vols., 1854, Vol. 1, p. 20. Microfilm, University of New England Archives.
24. Campbell. *op. cit.*, p. 241.
25. Edward Irby to his mother, 1 November, 1842, in *Irby Memoirs, loc. cit.*
26. Governor Gipps, in a despatch to the Colonial Secretary, 28 September, 1840. *Historical Records of Australia,* Series I, xx (1924), p. 841.

particularly good seasons in the late 1830's,[27] and he probably overlooked the extremes of abundance and poverty characteristic of natural pastures in the tableland climate, but whatever his evidence the residents did not share his opinion without qualification. Though the grass was plentiful, the Everetts at "Ollera" found the rain caused it to become rank and tough and the winters were so severe that they labelled August "starvation month".[28] Despite the fact that runs were large enough to accommodate sheep at one for every 4½ acres and allow them to select the most palatable grasses available,[29] feed quality was the limiting factor, and its limitations were most acute in winter as frosts "destroyed much of the herbage and the nourishing qualities of the grasses, which are found to be hard, dry and unfit for sheep."[30] Fluke, footrot and other diseases created additional hardships,[31] apart from the depredations by aborigines and native dogs.[32]

There are few references to the prevalence of kangaroos in the early records of the region when stock numbers were low, and one must assume that the squatters did not view them as a serious nuisance to the grazing industry. In the 1880's, however, there is evidence of large-scale slaughter of kangaroos, one property killing 10,000 in 1881 and another destroying 20,000 in four years.[33] It is unlikely that kangaroo shooting at this rate was a sudden innovation; more probably the marsupial population became a threat to productivity (or became so regarded) in the 1870's, or even earlier, and their slaughter gradually increased in severity. Their presence must be conceived in terms of a threat rather than an irresistible temptation to the sporting instincts of the settlers and their men, since graziers offered an incentive of 6d. a head for kangaroos and 3d. for wallabies.[34] Cane suggests that aboriginal hunting had kept the animals in check, and that

> "as the years passed, the blacks died out and the kangaroos and possums multiplied till they began to have a serious effect on the grass."[35]

This reasoning does not seem valid, however, since according to a report by the Commissioner for Crown Lands resident at Armidale in 1842, there were only five or six hundred aborigines on the tableland, or one person to every 22 square miles,[36] hardly a sufficient hunting force to control the kangaroo population, particularly when possums and small marsupials relatively easy to catch formed a large part of their diet.[37] Other explanations are possible. For example, it is more plausible to believe that the density of kangaroos was controlled by the availability of suitable feed, and that the large marsupials coexisted with the domestic

27. Cane, *op. cit.*, p. 24.
28. *ibid.*
29. Walker, *op. cit.*, p. 31.
30. Gardner, *op. cit.*, p. 25.
31. Cane, *op. cit.*, pp. 63-65.
32. *ibid.*, pp. 37, 71-72.
33. *ibid.*, p. 125.
34. *loc. cit.*
35. *ibid.*
36. R.B. Walker, "The Relation Between Aborigines and Settlers in New England, 1818-1900", *Armidale and District Historical Society, Journal and Proceedings*, 4 (1962), p. 8. The Aboriginal population was beginning to decline during this period: I.C. Campbell, 'The Relations Between Settlers and Aborigines in the Pastoral District of New England 1832-1860', unpublished B.A. Hons. thesis, University of New England, 1969.
37. Walker, *Old New England, op. cit.*, p. 5.

livestock until real or imagined competition for pasture provoked the graziers to introduce control measures.

Quite early in the history of the region, the squatters turned to European grasses and legumes to try and improve what Campbell called "the coarse and sour characteristics of much of the pasturage".[38] Marsh sowed the first white clover at Salisbury in 1841, and though many other English clovers and grasses were tried, white clover was the most successful.[39] Experimental use of lucerne began at "Ollera" in the late 1840's, and in the 1860's rye, cocksfoot, prairie grass and sheep's burnet were all sown for pasture.[40] The history of pasture improvement in New England is an absorbing study but must be left outside the scope of this paper, save to mention that thirty years after their introduction, rye, cocksfoot and prairie grass could be singled out for their potential contribution to the productivity of New England pastures.[41]

Cultivation of commercial crops flourished briefly in New England when the tableland was envisaged as a possible granary for the Colony, and with the wheat there came an influx of free selectors who challenged the holdings of the squatters and initiated a turning point in the pastoral industry. The Robertson Land Act of 1861 provided freehold farmers with security of tenure over a few hundred acres; selectors rushed in eagerly to accept the offer, but wheat farming was handicapped from the beginning by an unfavourable climate, low fertility soil in most areas, and insufficient capital to clear and prepare the ground properly and apply adequate fertilizer. Soil depletion and competition from better and cheaper Adelaide flour forced the collapse of New England's wheat industry by the 1880's, with the exception of the Inverell area. The free selectors who survived were generally those who abandoned crops and grazed fine-woolled merinos instead; others turned to maize, oats, potatoes or fruit, or sold out to large pastoral interests. Contrary to the expectations of 1861, the principal beneficiaries of Robertson's farming scheme were the squatters, who utilised the Act to acquire their own freehold properties which were amalgamations of selections bought by members of their own families and by "dummy" farmers under contract. In the scramble for the best land, however, the original pastoral holdings were severely trimmed, and the transformation from squattages to properties was accompanied by a reduction in their overall grazing acreage.[42] Efficient utilisation and control of available pasture became an important aspect of property management, and shepherd supervision of flocks was discarded in favour of a more economic paddock retention system. Fencing became imperative, and the squatters sought to improve the existing natural pasture by clearing the timber and burning off the frosted winter herbage.

Clearing and Burning

The early writings of three pioneer squatters mention timber treatment only on a very small scale - ringbarking swampy areas and preparing home paddocks for cultivation.[43]

38. Campbell, *op. cit.*, p. 241.
39. Marsh, *op. cit.*, p. 54.
40. Cane, *op. cit.*, p. 24.
41. F. Turner, *Australian Grasses*, Sydney, 1895, p. xxxii.
42. Walker, *Old New England, op. cit.*, Chapters 5 and 6.
43. Correspondence of Thomas Tourle, *op. cit., passim;* Irby Memoirs, *passim;* Cane, *op. cit.*, especially p. 63.

On the Everett's property, extensive clearing of grazing land did not begin until the 1870's.[44] The trees were initially ringbarked, which provided only a short-lived improvement in grass quality[45] and allowed a crop of suckers and saplings to spring up which, if left unchecked, gave the countryside a bush-like rather than park-like appearance.[46] Burning the dry top growth of grass in late winter or early spring ensured a flush of green grass with the onset of warm weather, but this practice could also have detrimental results if poorly managed.

There is no doubt that when the squatters arrived, grass fires were already a common occurrence, largely due to the careless attitude of aborigines.[47] The following two extracts indicate the prevalence of fires, their aboriginal origin, and their role in preventing brush growth in the open grasslands:

> i) The great [summer] heat is sometimes increased by the burning grass, which is generally lighted by the aborigines carrying fire about with them; these fires, when there is a wind, will burn for days, but if there is no wind, there is almost always a dew at night, which often puts them out. The sight of fires at night is sometimes magnificent, as whole ranges of mountains are lighted up by them. They have a great effect on the character of the country, as they burn many of the young trees, and thus prevent the forest from being too thick. All the country, except when heavily stocked with sheep, is sure to be burnt at least every two or three years.[48]

and

> ii) The country round three sides of the station is now on fire. . . It is generally supposed that these large fires are caused by the natives dropping their fire-sticks accidentally, and not from any design on their part of trying to burn the settlers out of their station. They sometimes burn the old grass off, in order that they may have a chance of killing kangaroos when they go to feed on the young grass that springs up, and also when they think they are likely to be pursued they fire it to prevent their tracks being seen.[49]

References to bushfires started by natives disappear from the records in the 1860's, probably because the aborigines were being brought within the authority of the white settlements.

In a note published in 1848, Mitchell also emphasised the utility of fires for aboriginal game-hunting and stressed their value in eliminating shrub and sapling growth in the grasslands. He added: "The squatters, it is true, have also been obliged to burn the old grass occasionally on their runs."[50] The extent to which pioneer squatters capitalised on the pasture response to aboriginal fires is a matter of conjecture, but it would appear that as the grazing industry developed the squatters adopted burning for their own purposes. The letters and diaries for the first two decades of the pioneers cited previously make no reference to

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44. Cane, *op. cit.*, p. 97.
45. P. Wright, "Pasture Improvement in New England", *Armidale and District Historical Society, Journal and Proceedings,* 7 (1964), p. 16.
46. Cane, *op. cit.*, p. 22, note (3).
47. A.R. King, *The Influence of Colonization on the Forests and the Prevalence of Bushfires in Australia,* CSIRO. report, Melbourne, 1963, p. 2.
48. Marsh, *op. cit.*, p. 413.
49. Edward Irby to his father, 6 December, 1842, Irby Memoirs, p. 41.
50. Mitchell, 1848, *op. cit.*, p. 413.

deliberate burning off, but by the end of the century it was an established procedure,[51] and is still a common feature of natural pasture management, despite its deleterious effects on soil properties and pasture quality if carried out on an annual basis over a long period.

Botanists[52]

The first stage in the botanical investigation of New England grasslands was gathering information on the species present. The principal nineteenth century collectors in the region were C. Stuart, C. Moore, R.I. Perrott, W. Woolls and F. Turner. Stuart was a collector employed by the Botanical Department at Melbourne[53] and, through von Mueller, provided the bulk of New England grasses cited by Bentham in the *Flora Australiensis*. The brief discussion that follows is concerned with the common and dominant grasses of the area.[54]

After Stuart, Turner made the next major contribution to botanical knowledge of the tableland, collecting widely and augmenting his material with specimens submitted by interested pastoralists. He published the first census of New England vegetation in 1903,[55] and in the Introduction to his book entitled "Australian Grasses" printed in 1895, he presents an assessment of New England as a grazing district, and specifies the common grasses and comments on their value.[56] On the basis of his remarks, the grasslands towards the end of last century were dominated by the tufted perennials *Sorghum leiocladum* (wild sorghum), *Themeda australis* (kangaroo grass), *Danthonia* spp. (wallaby grasses), *Dichanthium sericeum* (Queensland blue grass), *Poa* spp. (tussock grass, etc.), *Chloris truncata* (windmill grass), *Agropyron scabrum* (common wheat grass), and the summer annuals *Agrostis avenacea* and *Agrostis aemula* (blown grasses). He indicates that these grasses were all valuable as forage, though *Themeda australis* (kangaroo grass) was depressed by heavy stocking and the tussocky *Poa* spp. were palatable only when young, becoming hard and tough as they matured. Turner also cites the common occurrence of *Cynodon dactylon* (couch grass), *Eragrostis leptostachya* (paddock love grass), *Dichelachne crinita* (long-hair plume grass), and reports the prevalence of *Paspalum paspaloides* (water couch) in many damp places.

Around the turn of the century, Turner was not the only botanist to publish a number of vegetational studies on various regions of the Colony. R.H. Cambage wrote a series on the Native Flora of New South Wales, and in two parts of the series discussed the western

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51. P. Wright, *loc. cit.*, p. 16.

52. Charles Fraser, the Colonial Botanist, was a member of Oxley's expedition. His plant collections were sent to Britain and Europe but the author has not been able to discover whether he collected any New England grasses.

53. W. Woolls, "The Progress of Botanical Discovery in Australia", in *Lectures on the Vegetable Kingdom*, Sydney, 1879, p. 52.

54. The floristics of the New England grasses are considered in detail in Section B of the author's thesis on *The Grasses of the New England Region . . .* (1971), which also includes fuller statements of the contributions of Bentham, Turner, Maiden and other workers to our knowledge of the grass flora.

55. F. Turner, "The Vegetation of New England, New South Wales", *Proceedings of the Linnean Society of New South Wales*, 28 (1903), pp. 276-311.

56. Turner, *Australian Grasses, loc. cit.* Turner's scientific names were based on Bentham (Turner, *ibid.*, p. vi). The correct identities of grasses cited by Bentham, Turner and Maiden are discussed in the author's thesis, Norton, (1971). Where nomenclatural changes have occurred, the currently accepted

slopes of New England and the Deepwater-Torrington flora.[57, 58] Although his notes deal almost entirely with trees, shrubs and non-graminaceous herbs, Cambage does record *Themeda australis* (kangaroo grass) as a common grass in the vicinity of Emmaville and Deepwater.[59]

J.H. Maiden published a species list of the Howell district in 1906 in which he mentions twelve grasses, but *Themeda australis* is the only one which coincides with the tufted perennial dominants in Turner's assessment.[60] The other perennials in Maiden's paper include *Eulalia fulva* (silky browntop), *Cymbopogon refractus* (barbed-wire grass), *Capillipedium spicigerum* (scented-top grass), *Aristida vagans* (wire grass), *Eragrostis parviflora* (weeping love grass), and, in moist situations, *Arundinella nepalensis* (reed grass).

From the incomplete evidence of these few botanists, it is apparent that members of the tribe Andropogoneae contributed a significant proportion of the common tableland grasses, and that of these *Themeda australis* (kangaroo grass) was perhaps the most prominent.

Discussion

The pioneers discovered that New England was characterised by a relatively stable grassland community of savannah woodland with a park-like appearance. At that time the pasture was dominated by caespitose (tufted) perennials with a sparse ground-cover of decumbent species and annuals between the tussocks, apart from the high rainfall areas east of Armidale where the sward was more even.

The identity of the conspicuous dominant which John Everett in 1840 called "oat or forest grass" is uncertain, but there are several reasons for presuming that he referred to *Themeda australis,* now known as "kangaroo grass". *Themeda australis* was very common and occurred over most of the tableland: its companion species, *Themeda avenacea,* has been commonly called "tall oat grass", "oat kangaroo grass", and "native oat grass";[61] the inflorescence of *Themeda australis* with its lax, open habit and its spikelets bearing a long geniculate awn, is suggestive of the cultivated oats (*Avena* spp.); the inflorescence is distinctive, and might well have attracted the attention of a pioneer commenting on the vegetation, just as it had attracted Cambage during his trip to New England nearly seventy years later.

White settlement of the tableland upset two important features of the ecosystem which had operated for many centuries and helped shape the character of the vegetation. The

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56. (cont.) - names are used in this paper. The authorities for these names are provided in the Appendix. Common names of species are based on *Standardized Plant Names* (C.S.I.R.O., 1953).

57. R.H. Cambage, "Notes on the Native Flora of New South Wales, Part ii", *Proceedings of the Linnean Society of New South Wales,* 29 (1904), pp. 781-797.

58. R.H. Cambage, "Notes on the Native Flora of New South Wales. Part vi", *Proceedings of the Linnean Society of New South Wales,* 33 (1908), pp. 45-65.

59. *ibid.*, p. 62.

60. J.H. Maiden, "The Botany of Howell (Bora Creek): A Tin-Granite Flora", *Proceedings of the Linnean Society of New South Wales,* 31 (1906), pp. 63-72.

61. J.W. Vickery, "Gramineae", *Contributions from the New South Wales National Herbarium, Flora Series,* Sydney, No. 19, Part I (1961), p. 63.

incidence of bushfires was reduced by the gradual "civilisation" of the aboriginal population, and the grazing activities of the marsupial populations were influenced by the changes in land use.

The settlers also introduced a number of new factors into the ecosystem. Flocks of sheep created a steadily increasing ruminant grazing pressure, foreign herbage species were introduced, and some cultivation took place. The exotic species and efforts at farming had a limited effect. Weeds proliferated near settlements, but along with European grasses and clover they were slow to invade natural pastures before soil fertility was improved or intensive grazing depressed indigenous species. Cultivation was confined to small areas near townships and homesteads and other suitable localities, and in most cases was eventually abandoned for economic reasons.[62] Growing flock numbers exerted the major impact on the grasslands, and as livestock density increased and the free selector scheme constricted station size, the graziers introduced ringbarking and clearing of timber to serve their pastoral interests. At about the same time they adopted late-winter burning to assist brush control and to guarantee earlier and more accessible spring grass growth.

By the end of the century the tableland had changed from a park-like grassland grazed by marsupials and frequently but irregularly burnt, to a mixture of brush and savannah grazed mainly by ruminants and periodically burnt, often on an annual basis.

B.E. NORTON

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62. In 1959 only 14% of the New England area was sown to pastures and crops: *Soil and Pasture Research on the Northern Tablelands, New South Wales*, C.S.I.R.O., Melbourne, 1964, p. 3.

Acknowledgement: Initial leads for this historical investigation of New England grasslands were obtained from Professor R.B. Walker's analysis in *Old New England* (1966), which originally stimulated the enquiry.

APPENDIX

Grasses referred to in this paper

Where nomenclature changes have occurred, the name used by Bentham, Turner or Maiden is printed in square brackets. See footnotes 54 and 56.

Agropyron scabrum (R.Br.) Beauv.	
Agrostis aemula (R.Br.)	[*Deyeuxia forteri* Kunth.]
Agrostis avenacea Gmel.	[*Agrostis scabra* Willd. var. *elatior* Benth.]
Aristida vagans Cav.	
Arundinella nepalensis Trin.	
Avena spp.	
Capillipedium spicigerum S.T. Blake	[*Andropogon micranthus* Kunth. var. *spicigera* Benth.]
Chloris truncata (R.Br.)	
Cymbopogon refractus (R.Br.) A. Camus	[*Andropogon refractus* R.Br.]
Cynodon dactylon (L.) Pers.	
Danthonia spp.	
Dichanthium sericeum (R.Br.) A. Camus	[*Andropogon sericeus* R.Br.]
Dichelachne crinita (L.) Hook. f.	
Eragrostis leptostachya Steud.	
Eragrostis parviflora (R.Br.) Trin.	[*Eragrostis pilosa* Beauv.]
Eulalia fulva (R.Br.) O. Kuntze	[*Pollinia fulva* Benth.]
Paspalum paspaloides (Michx.) Scribn.	[*Paspalum distichum* L.]
Poa spp.	
Sorghum leiocladum (Hack.) C.E. Hubbard	[*Sorghum plumosum* Beauv.]
Themeda australis (R.Br.) Stapf.	[*Anthistiria ciliata* L.]
Themeda avenacea (F. Muell.) Durand et Jackson	[*Anthistiria avenacea* F. Muell.]

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